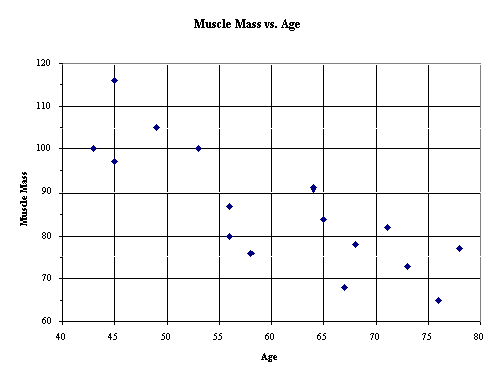
**Linear Regression Worksheet 1**

Does a person's muscle mass decrease with age? To explore this relationship in women, a nutritionist randomly selected four women from each 10-year age group, beginning with age 40 and ending with age 79.

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| --- |
| Obsn mus\_mass age  1 82 71  2 91 64  3 100 43  4 68 67  5 87 56  6 73 73  7 78 68  8 80 56  9 65 76  10 84 65  11 116 45  12 76 58  13 97 45  14 100 53  15 105 49  16 77 78 |



The least squares regression line is: Y-hat = 148.0 - 1.023 x. (Y-hat stands for a Y with a caret (^) over it; the predicted value).

1. The first observation has age = 71.0 and muscle mass = 82. Identify this value on the plot.
2. Carefully plot the line. Use x = 40 and x = 80 to do so.
3. From your plot alone, predict the muscle mass of a 60 year old.
4. Use the equation to check your answer to part 3.
5. Complete the table below. For each observation the table lists the age and muscle mass. You should fill in the predicted value and residual. (Some have been filled in for you.)
6. Sum the residuals. What do you get?
7. Sort the residuals.
8. Report an 80% prediction interval for the muscle mass of a 60 year old. Plot the interval.
9. Report an 80% prediction interval for the muscle mass of a 43 year old. Plot the interval.
10. Complete your plot by drawing 80% prediction bands.
11. What %-age of the data fall within these prediction bands? (Count an observation falling right on a band as being 1/2-in and 1/2 out.)

|  |  |  |  |
| --- | --- | --- | --- |
| Age | Muscle Mass | Predicted Y | Residual |
| 71 | 82 | 75.4 | 6.6 |
| 64 | 91 | 82.5 | 8.5 |
| 43 | 100 | 104.0 | -4.0 |
| 67 | 68 | 79.5 | -11.5 |
| 56 | 87 | 90.7 | -3.7 |
| 73 | 73 | 73.3 | -0.3 |
| 68 | 78 |  |  |
| 56 | 80 |  |  |
| 76 | 65 |  |  |
| 65 | 84 |  |  |
| 45 | 116 |  |  |
| 58 | 76 |  |  |
| 45 | 97 | 102.0 | -5.0 |
| 53 | 100 | 93.8 | 6.2 |
| 49 | 105 | 97.9 | 7.1 |
| 78 | 77 | 68.2 | 8.8 |

**ANSWERS**

1. **86.6**

6. **Sum = 0**. (It works out to 0.1 due to accumulated rounding errors in the residuals.)

8. **(75.1, 95.4)**. (The "official method"-covered in Math 258-yields (75.0, 98.2).)

9. **(92.5, 112.8)**